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10/738,459	12/17/2003	James M. Tour	11321-P060US	9579

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EXAMINER
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WONG, EDNA

ART UNIT	PAPER NUMBER
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1753

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
3 MONTHS	03/14/2007	PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

## Office Action Summary

Application No.

10/738,459

Applicant(s)

TOUR ET AL.

Examiner

Edna Wong

Art Unit

1753

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 08 January 2007.  
2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.  
3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-27 is/are pending in the application.  
4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.  
5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.  
6) ☒ Claim(s) 1-27 is/are rejected.  
7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.  
8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.  
10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).  
11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
a) ☐ All b) ☐ Some \* c) ☐ None of:  
1. ☐ Certified copies of the priority documents have been received.  
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.  
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).  
\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)  
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)  
3) ☐ Information Disclosure Statement(s) (PTO/SB/08)  
Paper No(s)/Mail Date \_\_\_\_\_.  
4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_.  
5) ☐ Notice of Informal Patent Application  
6) ☐ Other: \_\_\_\_\_

This is in response to the Amendment dated January 8, 2007. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

### ***Response to Arguments***

#### **Double Patenting**

I. Claims **1-27** have been provisionally rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1-11 of copending Application No. **10/764,092**.

The rejection of claims 1-27 under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1-11 of copending Application No. 10/764,092 is as applied in the Office Actions dated September 29, 2005, March 28, 2006 and September 12, 2006 and incorporated herein. The rejection has been maintained for the following reasons:

Applicants state that if the “provisional” double patenting rejection is the only rejection remaining in the Application, then the Examiner should withdraw the rejection and permit the Application to issue as a patent.

In response, the provisional double patenting rejection is not the only rejection remaining in the Application.

II. Claims **1-27** have been provisionally rejected under the judicially created doctrine

of obviousness-type double patenting as being unpatentable over claims 1-28 of copending Application No. **10/738,168**.

The rejection of claims 1-27 under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1-28 of copending Application No. 10/738,168 is as applied in the Office Actions dated September 29, 2005, March 28, 2006 and September 12, 2006 and incorporated herein. The rejection has been maintained for the following reasons:

Applicants state that if the "provisional" double patenting rejection is the only rejection remaining in the Application, then the Examiner should withdraw the rejection and permit the Application to issue as a patent.

In response, the provisional double patenting rejection is not the only rejection remaining in the Application.

Claim Rejections - 35 USC § 102/103

I. Claims **1 and 3-7** have been rejected under 35 U.S.C. 102(b) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over **Hong et al.** ("Synthesis of Carbon Nanotubes by Microwave Heating", *Proceedings of the Sixth Applied Diamond Conference/Second Frontier Carbon Technology Joint Conference (ADC/FCT 2001)*, July 1, 2001, pp. 805-809) in combination with **DE 3915044** ('044).

The rejection of claims 1 and 3-7 under 35 U.S.C. 102(b) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Hong et al. in combination with

DE 3915044 ('044) has been withdrawn in view of Applicants' amendment.

II. Claims 8, 11-12 and 14-18 have been rejected under 35 U.S.C. 102(b) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over **Hong et al.** ("Synthesis of Carbon Nanotubes by Microwave Heating", *Proceedings of the Sixth Applied Diamond Conference/Second Frontier Carbon Technology Joint Conference (ADC/FCT 2001)*, July 1, 2001, pp. 805-809) in combination with **DE 3915044 ('044)**.

The rejection of claims 8, 11-12 and 14-18 under 35 U.S.C. 102(b) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Hong et al. in combination with DE 3915044 ('044) has been withdrawn in view of Applicants' amendment.

### ***Response to Amendment***

#### ***Claim Rejections - 35 USC § 102/103***

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

I. Claims **1-4 and 7** are rejected under 35 U.S.C. 102(e) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over **Harutyunyan et al.** (US Patent No. 7,014,737 B2).

Harutyunyan teaches a method of crosslinking carbon nanotubes comprising:

- (1) providing carbon nanotubes (col. 4, line 64 to col. 5, line 5); and
- (2) irradiating said carbon nanotubes with microwaves (= exposing the crude reaction product comprising the carbon nanotubes and the residual catalyst particles to microwave radiation) [col. 7, lines 60-67].

The step of irradiating is carried out in an inert environment selected from the group consisting of ultra-high vacuum, high vacuum, inert gases, and combinations thereof (= the fluid may be a gas or a liquid, including, for example, air, nitrogen, oxygen, argon, helium, hydrochloric acid, nitric acid, and mixtures thereof) [col. 8, lines 21-24].

The microwave radiation comprises a frequency that ranges from about 0.01 GHz to about 100 GHz (= 2.45 GHz) [col. 7, lines 65-67].

The frequency ranges from about 1 GHz to about 18 GHz (= 2.45 GHz) [col. 7, lines 65-67].

The microwave radiation has a power that ranges from about 1 W to about 10,000 W (= 150 W) [col. 7, lines 65-67].

The power ranges from about 10 W to about 1,000 W (= 150 W) [col. 7, lines 65-67].

The method of Harutyunyan differs from the instant invention because Harutyunyan does not disclose the following:

- a. Yielding a plurality of crosslinked nanotubes, as recited in claim 1.
- b. Wherein the plurality of crosslinked carbon nanotubes comprises at least one junction formed via a rearrangement of carbon atoms, as recited in claim 7.

The invention as a whole would have been obvious to one having ordinary skill in the art at the time the invention was made because Harutyunyan discloses a method at least in a similar manner as instantly claimed. Therefore, one having ordinary skill in the art would have expected that similar processes can reasonably be expected to yield products which inherently have the same properties. *In re Spada* 15 USPQ 2d 1655 (CAFC 1990); *In re DeBlauwe* 222 USPQ 191; *In re Wiegand* 86 USPQ 155 (CCPA 195).

Furthermore, the method claims are attempting to define subject matter in terms of the result to be achieved, which merely amounts to a statement of the underlying problem, without providing the technical features necessary for achieving this result.

II. Claims **8-9, 11-15 and 18** are rejected under 35 U.S.C. 102(e) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over **Harutyunyan et al.** (US Patent No. 7,014,737 B2).

Harutyunyan teaches a method of crosslinking carbon nanotubes comprising:

(1) providing carbon nanotubes (col. 4, line 64 to col. 5, line 5); and  
(2) irradiating said carbon nanotubes with microwaves (= exposing the crude reaction product comprising the carbon nanotubes and the residual catalyst particles to microwave radiation) [col. 7, lines 60-67].

The carbon nanotubes are single-wall carbon nanotubes (col. 4, line 64 to col. 5, line 5).

The step of irradiating is carried out in an inert environment selected from the group consisting of ultra-high vacuum, high vacuum, inert gases, and combinations thereof (= the fluid may be a gas or a liquid, including, for example, air, nitrogen, oxygen, argon, helium, hydrochloric acid, nitric acid, and mixtures thereof) [col. 8, lines 21-24].

The microwave radiation comprises a frequency that ranges from about 0.01 GHz to about 100 GHz (= 2.45 GHz) [col. 7, lines 65-67].

The frequency ranges from about 1 GHz to about 18 GHz (= 2.45 GHz) [col. 7, lines 65-67].

The microwave radiation has a power that ranges from about 1 W to about 10,000 W (= 150 W) [col. 7, lines 65-67].



The power ranges from about 10 W to about 1,000 W (= 150 W) [col. 7, lines 65-67].

The method of Harutyunyan differs from the instant invention because Harutyunyan does not disclose the following:

- a.     Wherein crosslinking is generated between the sidewalls of adjacent carbon nanotubes, as recited in claim 8.
- b.     Wherein the crosslinking comprises covalent bonds, as recited in claim 11.
- c.     Wherein the covalent bonds are carbon-carbon bonds, as recited in claim 12.

The invention as a whole would have been obvious to one having ordinary skill in the art at the time the invention was made because Harutyunyan discloses a method at least in a similar manner as instantly claimed. Therefore, one having ordinary skill in the art would have expected that similar processes can reasonably be expected to yield products which inherently have the same properties. *In re Spada* 15 USPQ 2d 1655 (CAFC 1990); *In re DeBlauwe* 222 USPQ 191; *In re Wiegand* 86 USPQ 155 (CCPA 195).

Furthermore, the method claims are attempting to define subject matter in terms of the result to be achieved, which merely amounts to a statement of the underlying problem, without providing the technical features necessary for achieving this result.

III. Claims **19, 21-24 and 27** are rejected under 35 U.S.C. 102(e) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over **Harutyunyan et al.** (US Patent No. 7,014,737 B2).

Harutyunyan teaches a method of crosslinking carbon nanotubes comprising:

(1) providing single-wall carbon nanotubes (col. 4, line 64 to col. 5, line 5); and  
(2) irradiating said single-wall carbon nanotubes with microwaves (= exposing the crude reaction product comprising the carbon nanotubes and the residual catalyst particles to microwave radiation) [col. 7, lines 60-67],

wherein the step of irradiating is carried out in an inert environment selected from the group consisting of ultra-high vacuum, high vacuum, inert gases, and combinations thereof (= the fluid may be a gas or a liquid, including, for example, air, nitrogen, oxygen, argon, helium, hydrochloric acid, nitric acid, and mixtures thereof) [col. 8, lines 21-24].

The microwave radiation comprises a frequency that ranges from about 0.01 GHz to about 100 GHz (= 2.45 GHz) [col. 7, lines 65-67].

The frequency ranges from about 1 GHz to about 18 GHz (= 2.45 GHz) [col. 7, lines 65-67].

The microwave radiation has a power that ranges from about 1 W to about 10,000 W (= 150 W) [col. 7, lines 65-67].

The power ranges from about 10 W to about 1,000 W (= 150 W) [col. 7, lines 65-67].

The method of Harutyunyan differs from the instant invention because Harutyunyan does not disclose the following:

- a. Yielding a plurality of crosslinked single-wall carbon nanotubes, as recited in claim 19.
- b. Wherein the crosslinking comprises covalent bonds, as recited in claim 21.
- c. Wherein the covalent bonds are carbon-carbon bonds, as recited in claim 22.
- d. Wherein the plurality of crosslinked single-wall carbon nanotubes comprises at least one junction formed via a rearrangement of carbon atoms, as recited in claim 27.

The invention as a whole would have been obvious to one having ordinary skill in the art at the time the invention was made because Harutyunyan discloses a method at least in a similar manner as instantly claimed. Therefore, one having ordinary skill in the art would have expected that similar processes can reasonably be expected to yield products which inherently have the same properties. *In re Spada* 15 USPQ 2d 1655 (CAFC 1990); *In re DeBlauwe* 222 USPQ 191; *In re Wiegand* 86 USPQ 155 (CCPA 195).

Furthermore, the method claims are attempting to define subject matter in terms of the result to be achieved, which merely amounts to a statement of the underlying problem, without providing the technical features necessary for achieving this result.

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IV. Claims 1 and 7 are rejected under 35 U.S.C. 102(b) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over **WO 01/75903** ('703).

WO '703 teaches a method of crosslinking carbon nanotubes comprising:

(1) providing carbon nanotubes (page 4, line 27; page 5, line 13; and page 6, lines 15-21); and

(2) irradiating said carbon nanotubes with microwaves (= by using electromagnetic radiation, such as microwaves or light to irradiate nanostructures, excited electrons are produced) [page 9, lines 19-20].

The method of WO '703 differs from the instant invention because WO '703 does not disclose the following:

- a. Yielding a plurality of crosslinked nanotubes, as recited in claim 1.
- b. Wherein the plurality of crosslinked carbon nanotubes comprises at least one junction formed via a rearrangement of carbon atoms, as recited in claim 7.

The invention as a whole would have been obvious to one having ordinary skill in the art at the time the invention was made because WO '703 discloses a method at least in a similar manner as instantly claimed. Therefore, one having ordinary skill in the art would have expected that similar processes can reasonably be expected to yield products which inherently have the same properties. *In re Spada* 15 USPQ 2d 1655 (CAFC 1990); *In re DeBlauwe* 222 USPQ 191; *In re Wiegand* 86 USPQ 155 (CCPA 195).

Furthermore, the method claims are attempting to define subject matter in terms of the result to be achieved, which merely amounts to a statement of the underlying problem, without providing the technical features necessary for achieving this result.

**V.** Claims **8-9, 11-12 and 18** are rejected under 35 U.S.C. 102(b) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over **WO 01/75903 ('703)**.

WO '703 teaches a method of crosslinking carbon nanotubes comprising:

(1) providing carbon nanotubes (page 4, line 27; page 5, line 13; and page 6, lines 15-21); and

(2) irradiating said carbon nanotubes with microwaves (= by using electromagnetic radiation, such as microwaves or light to irradiate nanostructures, excited electrons are produced) [page 9, lines 19-20].

The carbon nanotubes are single-wall carbon nanotubes (page 6, lines 18-21).

The method of WO '703 differs from the instant invention because WO '703 does not disclose the following:

- a. Yielding a plurality of crosslinked nanotubes, as recited in claim 8.
- b. Wherein crosslinking is generated between the sidewalls of adjacent carbon nanotubes, as recited in claim 8.
- c. Wherein the crosslinking comprises covalent bonds, as recited in claim 11.
- d. Wherein the covalent bonds are carbon-carbon bonds, as recited in claim

12.

e. Wherein the plurality of crosslinked carbon nanotubes comprises at least one junction formed via a rearrangement of carbon atoms, as recited in claim 18.

The invention as a whole would have been obvious to one having ordinary skill in the art at the time the invention was made because WO '703 discloses a method at least in a similar manner as instantly claimed. Therefore, one having ordinary skill in the art would have expected that similar processes can reasonably be expected to yield products which inherently have the same properties. *In re Spada* 15 USPQ 2d 1655 (CAFC 1990); *In re DeBlauwe* 222 USPQ 191; *In re Wiegand* 86 USPQ 155 (CCPA 195).

Furthermore, the method claims are attempting to define subject matter in terms of the result to be achieved, which merely amounts to a statement of the underlying problem, without providing the technical features necessary for achieving this result.

VI. Claims 1 and 7 are rejected under 35 U.S.C. 102(b) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over **KO 2002-0046342** ('342).

KO '342 teaches a method of crosslinking carbon nanotubes comprising:

- (1) providing carbon nanotubes (= a microscopic coil of carbon nanotube); and
- (2) irradiating said carbon nanotubes with microwaves (= irradiating the microscopic coil of carbon nanotube with electromagnetic waves which includes microwaves) [page 4, lines 3-7 and lines 18-24].

The method of KO '342 differs from the instant invention because KO '342 does not disclose the following:

- a. Yielding a plurality of crosslinked nanotubes, as recited in claim 1.
- b. Wherein the plurality of crosslinked carbon nanotubes comprises at least one junction formed via a rearrangement of carbon atoms, as recited in claim 7.

The invention as a whole would have been obvious to one having ordinary skill in the art at the time the invention was made because KO '342 discloses a method at least in a similar manner as instantly claimed. Therefore, one having ordinary skill in the art would have expected that similar processes can reasonably be expected to yield products which inherently have the same properties. *In re Spada* 15 USPQ 2d 1655 (CAFC 1990); *In re DeBlauwe* 222 USPQ 191; *In re Wiegand* 86 USPQ 155 (CCPA 195).

Furthermore, the method claims are attempting to define subject matter in terms of the result to be achieved, which merely amounts to a statement of the underlying problem, without providing the technical features necessary for achieving this result.

**VII. Claims 8, 11-12 and 18** are rejected under 35 U.S.C. 102(b) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over **KO 2002-0046342 ('342)**.

KO '342 teaches a method of crosslinking carbon nanotubes comprising:

- (1) providing carbon nanotubes (= a microscopic coil of carbon nanotube); and
- (2) irradiating said carbon nanotubes with microwaves (= irradiating the

microscopic coil of carbon nanotube with electromagnetic waves which includes microwaves) [page 4, lines 3-7 and lines 18-24].

The method of KO '342 differs from the instant invention because KO '342 does not disclose the following:

- a. Yielding a plurality of crosslinked nanotubes, as recited in claim 8.
- b. Wherein crosslinking is generated between the sidewalls of adjacent carbon nanotubes, as recited in claim 8.
- c. Wherein the crosslinking comprises covalent bonds, as recited in claim 11.
- d. Wherein the covalent bonds are carbon-carbon bonds, as recited in claim 12.
- e. Wherein the plurality of crosslinked carbon nanotubes comprises at least one junction formed via a rearrangement of carbon atoms, as recited in claim 18.

The invention as a whole would have been obvious to one having ordinary skill in the art at the time the invention was made because KO '342 discloses a method at least in a similar manner as instantly claimed. Therefore, one having ordinary skill in the art would have expected that similar processes can reasonably be expected to yield products which inherently have the same properties. *In re Spada* 15 USPQ 2d 1655 (CAFC 1990); *In re DeBlauwe* 222 USPQ 191; *In re Wiegand* 86 USPQ 155 (CCPA 195).

Furthermore, the method claims are attempting to define subject matter in terms



of the result to be achieved, which merely amounts to a statement of the underlying problem, without providing the technical features necessary for achieving this result.

***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

I. Claims 5 and 6 are rejected under 35 U.S.C. 103(a) as being unpatentable over **Harutyunyan et al.** (US Patent No. 7,014,737 B2) as applied to claims 1-4 and 7 above, and further in view of **Fliflet et al.** ("Application of Microwave Heating to Ceramic Processing: Design and Initial Operation of a 2.45-GHz Single-Mode Furnace", *IEEE Transactions on Plasma Science*, Vol. 24, No. 3, June 1996, pp. 1041-1049).

Harutyunyan is as applied above and incorporated herein.

The method of Harutyunyan differs from the instant invention because Harutyunyan does not disclose wherein the microwave radiation is generated by a magnetron, as recited in claim 5.

Harutyunyan teaches a tuned TE103 single mode cavity driven by a 1.5 kW, 2.45 GHz power supply (col. 11, lines 41-45).

Like Harutyunyan, Fliflet teaches microwave heating. Fliflet teaches a NRL 2.45-GHz microwave furnace system wherein the microwave source is a Cober S6F 2.45-

GHz industrial magnetron-based source which can produce up to 6 kW of continuous wave (CW) power and the microwave cavity is a  $TE_{103}$  rectangular wave guide mode (pages 1042-1043, "II. Microwave Applicator System").

It would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the microwave radiation described by Harutyunyan with wherein the microwave radiation is generated by a magnetron because a magnetron-based source would have produced 1.5 kW and 2.45 GHz of power as taught by Fliflet (pages 1042-1043, "II. Microwave Applicator System").

II. Claim 10 is rejected under 35 U.S.C. 103(a) as being unpatentable over **Harutyunyan et al.** (US Patent No. 7,014,737 B2) as applied to claims 8-9, 11-15 and 18 above, and further in view of **Holtzinger et al.** ("Sidewall Functionalization of Carbon Nanotubes", *Angew. Chem. Int. Ed.*, 2001, Vol. 40, No. 21, pp. 4002-4005).

Harutyunyan is as applied above and incorporated herein.

The method of Harutyunyan differs from the instant invention because Harutyunyan does not disclose wherein the carbon nanotubes are chemically functionalized prior to the step of irradiating, as recited in claim 10.

Harutyunyan teaches that it is desirable to remove or deteriorate the shells so that the residual catalyst can be more readily removed (col. 4, lines 39-42).

Holzinger teaches that chemical derivatization of the nanotubes is desirable to improve their solubility and processibility (page 4002).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the carbon nanotubes described by Harutyunyan with wherein the carbon nanotubes are chemically functionalized prior to the step of irradiating because this would have improved their solubility and processibility as taught by Holtzinger (page 4002).

III. Claims **16 and 17** are rejected under 35 U.S.C. 103(a) as being unpatentable over **Harutyunyan et al.** (US Patent No. 7,014,737 B2) as applied to claims 8-9, 11-15 and 18 above, and further in view of **Fliflet et al.** ("Application of Microwave Heating to Ceramic Processing: Design and Initial Operation of a 2.45-GHz Single-Mode Furnace", *IEEE Transactions on Plasma Science*, Vol. 24, No. 3, June 1996, pp. 1041-1049).

Harutyunyan is as applied above and incorporated herein.

The method of Harutyunyan differs from the instant invention because Harutyunyan does not disclose wherein the microwave radiation is generated by a magnetron, as recited in claim 16.

Harutyunyan teaches a tuned TE<sub>103</sub> single mode cavity driven by a 1.5 kW, 2.45 GHz power supply (col. 11, lines 41-45).

Like Harutyunyan, Fliflet teaches microwave heating. Fliflet teaches a NRL 2.45-GHz microwave furnace system wherein the microwave source is a Cober S6F 2.45-GHz industrial magnetron-based source which can produce up to 6 kW of continuous wave (CW) power and the microwave cavity is a TE<sub>103</sub> rectangular wave guide mode

(pages 1042-1043, "II. Microwave Applicator System").

It would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the microwave radiation described by Harutyunyan with wherein the microwave radiation is generated by a magnetron because a magnetron-based source would have produced 1.5 kW and 2.45 GHz of power as taught by Fliflet (pages 1042-1043, "II. Microwave Applicator System").

**IV.** Claim **20** is rejected under 35 U.S.C. 103(a) as being unpatentable over **Harutyunyan et al.** (US Patent No. 7,014,737 B2) as applied to 19, 21-24 and 27 above, and further in view of **Holtzinger et al.** ("Sidewall Functionalization of Carbon Nanotubes", *Angew. Chem. Int. Ed.*, 2001, Vol. 40, No. 21, pp. 4002-4005).

Harutyunyan is as applied above and incorporated herein.

The method of Harutyunyan differs from the instant invention because Harutyunyan does not disclose wherein the carbon nanotubes are chemically functionalized prior to the step of irradiating, as recited in claim 20.

Harutyunyan teaches that it is desirable to remove or deteriorate the shells so that the residual catalyst can be more readily removed (col. 4, lines 39-42).

Holzinger teaches that chemical derivatization of the nanotubes is desirable to improve their solubility and processibility (page 4002).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the carbon nanotubes described by Harutyunyan

with wherein the carbon nanotubes are chemically functionalized prior to the step of irradiating because this would have improved their solubility and processibility as taught by Holtzinger (page 4002).

**V.** Claims **25 and 26** are rejected under 35 U.S.C. 103(a) as being unpatentable over **Harutyunyan et al.** (US Patent No. 7,014,737 B2) as applied to claims 19, 21-24 and 27 above, and further in view of **Fliflet et al.** ("Application of Microwave Heating to Ceramic Processing: Design and Initial Operation of a 2.45-GHz Single-Mode Furnace", *IEEE Transactions on Plasma Science*, Vol. 24, No. 3, June 1996, pp. 1041-1049).

Harutyunyan is as applied above and incorporated herein.

The method of Harutyunyan differs from the instant invention because Harutyunyan does not disclose wherein the microwave radiation is generated by a magnetron, as recited in claim 25.

Harutyunyan teaches a tuned TE<sub>103</sub> single mode cavity driven by a 1.5 kW, 2.45 GHz power supply (col. 11, lines 41-45).

Like Harutyunyan, Fliflet teaches microwave heating. Fliflet teaches a NRL 2.45-GHz microwave furnace system wherein the microwave source is a Cober S6F 2.45-GHz industrial magnetron-based source which can produce up to 6 kW of continuous wave (CW) power and the microwave cavity is a TE<sub>103</sub> rectangular wave guide mode (pages 1042-1043, "II. Microwave Applicator System").

It would have been obvious to one having ordinary skill in the art at the time the

invention was made to have modified the microwave radiation described by Harutyunyan with wherein the microwave radiation is generated by a magnetron because a Cober S6F 2.45-GHz industrial magnetron-based source would have produced 1.5 kW and 2.45 GHz of power as taught by Fliflet (pages 1042-1043, "II. Microwave Applicator System").

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

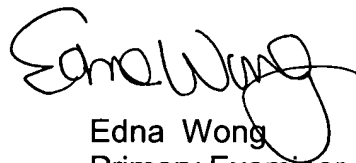
A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Edna Wong whose telephone number is (571) 272-

1349. The examiner can normally be reached on Mon-Fri 7:30 am to 4:00 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nam Nguyen can be reached on (571) 272-1342. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

  
Edna Wong  
Primary Examiner  
Art Unit 1753

EW  
March 11, 2007